Research Defence Society.

Form C21.

21, Ladbroke Square,
London, W.
May, 1912.

Animal Experiments in Relation to Sleeping Sickness.

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Founded in January, 1908, to make generally known the facts about experiments on animals in this country, and the regulations under which they are conducted: the immense importance of such experiments to the welfare of mankind: and the great saving of human and animal life and health which is already due to them.

The Society gives information to all who desire to examine the arguments on behalf of experiments on animals: makes all necessary arrangements for lectures and debates: and publishes and distributes literature. It has already (May, 1912) more than 5,000 Members and Associates.

The minimum subscription, for working expenses, is five shillings, but undergraduates and students of medicine are eligible for membership at an annual subscription of half-a-crown. Larger subscriptions, or donations, will be gladly received. Associates pay a subscription of one shilling. A donation of £10 constitutes life-membership.

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Animal Experiments in Relation to Sleeping Sickness.

GLOSSINA PALPALIS.

THE TSETSE FLY AND NAGANA

IN the year 1850 the well-known hunter, Gordon Cumming, met, in what is now the Transvaal, "the famous fly called tsetse, whose bite is certain death to oxen and horses." Many travellers, including David Livingstone, have described this pest, and the disease of domestic animals, Nagana, which it was supposed to cause; but for years it remained uncertain whether there was any real connection between Nagana and the tsetse fly. As late as 1885, the opinion was expressed that tsetse flies were probably not more poisonous than European blood-sucking gnats and flies. In 1895, Surgeon-Major David Bruce made a study of Nagana. He established his camp in Zululand, on a high hill rising out of plains on which the tsetse fly swarmed; the hill itself was free. He caught tsetse flies in the plain, brought them to the hill top, and caused them to bite healthy dogs and horses. Whereas animals not bitten

did not contract the disease, these animals did ; and their blood was found to contain the minute parasite called trypanosome, which he had found, by the inoculation of animals, to be the cause. By this and other experiments he clearly proved that the tsetse carries the trypanosome, a living virus, from animal to animal.

SLEEPING SICKNESS: HOW IT IS TRANSMITTED

In 1900, the then mysterious disease called Sleeping Sickness was discovered in Uganda. It rapidly spread, killing thousands of natives. It was attributed to food poisoning, to worms in the blood, or to bacteria ; but no means of checking it could be suggested. In 1903, it was found to be caused by a minute parasite in the blood resembling that which causes Nagana and, like it, a trypanosome ; but this knowledge did not enable us to combat the disease ; we had first to learn how the trypanosome got into the blood. In consequence of his former experiments on animals, Bruce, who was sent to investigate, suspected that this trypanosome also was introduced into the victims by the bite of a tsetse fly. Hitherto no suspicion whatever had attached to that or any other insect : and owing to ignorance of how the disease was caught, no preventive measures whatever could be undertaken. Bruce caused tsetse flies (*Glossina palpalis*) to be caught on the Lake shore where Sleeping Sickness was found, and put them to bite healthy monkeys. These monkeys contracted Sleeping Sickness, whereas monkeys protected from bites did not.

PREVENTIVE MEASURES

It was thus proved that Sleeping Sickness is the human form of tsetse fly disease ; and it became possible to devise preventive measures. Thus, it was observed that the fly is not found except close to water. Hence, by moving native villages away from the water, it was possible to prevent the inhabitants from becoming bitten and so infected ; and natives could be to some extent prevented from visiting places infested with flies. It was found that shade was essential to the existence of the fly. Hence, removal of the shrubs affording shade banished both

the insect and the disease. It was found that the fly was hindered or prevented from biting by clothes. Hence, the wearing of clothes gave protection against the disease. It was found that the fly did not bite at night or in the early morning or late afternoon. Hence, fly-haunted places could be visited at those times with impunity. Moreover, we now learned that an infected person is harmless to others as long as he is not bitten by tsetse ; and we took care to keep him from the fly's haunts. Without the knowledge obtained from experiments on animals, none of these preventive measures could have been devised : and numbers of human beings, white as well as black, would have become mortally infected.

DIAGNOSIS

We thus learned, by experiments on animals, how Sleeping Sickness is caught, knowledge which is the foundation of efforts to prevent it. But this, though the first service done us by such experiments, is by no means the only one. In a vast wild country like Tropical Africa, inhabited by natives of conservative habits, it is impossible to prevent all cases of infection, and for obvious reasons these must be detected early. We see, for instance, a man who has been subject to the bites of tsetse and, we think, may have the disease. We are unable to find the trypanosome in his blood, and are therefore uncertain ; whereas prompt diagnosis is very important. We introduce under the skin of a series of animals a small quantity of blood from the patient. If in the course of a few days one or more animals become ill and trypanosomes are found in their blood, uncertainty becomes certainty, and we can undertake vigorous treatment.

TREATMENT

Attempts have been, and are now being made, to find a drug which will cure Sleeping Sickness. Without experiments on animals there would be no hope of success. Even if we were justified in trying a series of unknown powerful drugs on a human being, it would be impossible to say whether any was or was not of value, because the Sleeping Sickness patient may, and often does, improve for a time without any treatment ; and the disease has been known to last, with long intervals of apparent health, eight years. The drugs are therefore tested

A haunt of *Glossina Palpalis*. Note the stream, the woody vegetation, and the lightly clad natives.

one by one on small animals artificially infected with trypanosomes. Without treatment, the animals die in a few days. With it, if the drug is of service, their lives are prolonged : and with certain drugs used in the right doses a complete cure results. By this means several trypanosome-killing substances have been found, which are used in the treatment of man ; and, if treatment is begun soon after infection is contracted, the patient has a good chance of recovery. Moreover, the domestic animals benefit from these experiments, for we are enabled to cure them also.

TEST OF CURE

Again, we have a patient who has undergone a long course of treatment and is now apparently quite well. If a European, he wishes perhaps to resume his work in Africa, or at least to be assured that he has really recovered. If he is a native, we want to know whether he is still a source of infection to his fellows. Some of his blood is on one or more occasions introduced into a series of susceptible animals. If no infection is produced, a load is taken from his mind, and he resumes his work or returns to his village ; if an animal becomes infected, the patient takes a fresh course of treatment.

SLEEPING SICKNESS IN RHODESIA

In the last two years Sleeping Sickness has appeared in Rhodesia and Nyasaland, in regions where the Sleeping Sickness tsetse, *Glossina palpalis*, is not found. It became necessary to find out what insect was spreading the disease, because without this knowledge no precautions could be taken. Here again we have recourse to experiments on animals, such as those carried out by Bruce. We shall soon know with certainty what species of insect is responsible, and take our measures accordingly.

WILD ANIMALS AND SLEEPING SICKNESS

It is now suspected that certain wild animals are in part responsible for the spread of Sleeping Sickness ; that they harbour the human trypanosome in their blood without themselves being hurt ; and that thus the tsetse fly, which feeds on them, has at

command a never-failing store of the deadly parasite. The matter is being studied in Nyasaland by a Commission. The parasites are often so scarce in the blood of these animals that it is useless to look for them with the microscope; many hours of systematic search might not avail to reveal one. The only possible means in such cases of detecting their presence is to inject some of the blood into a susceptible animal, and watch whether it becomes infected; or to make tsetse flies feed on them, and afterwards on animals which are more susceptible. These are the methods which the Commission is using. We shall thus get to know what wild animals harbour the human trypanosome, and take suitable measures.

Thus, every fresh problem is solved by the experimental method; and this implies experiments on animals. Since the way in which the disease spreads was discovered, the annual death rate from Sleeping Sickness on the Uganda shores of the Victoria Nyanza has fallen from 8,000 to 500. There are several causes for this happy reduction, but chief among them may be reckoned the present measures of protection and prevention to which our men of science have been led by the help of experiments on animals. To give up experiments on animals would be to throw away the only key which can discover to us what is still unknown about Sleeping Sickness; and the more complete our knowledge, the less difficult is prevention.

NOTE.

The Hon. Secretary of the Research Defence Society will be happy to receive applications for Membership or Associateship, to answer enquiries, to make arrangements for addresses or lantern-lectures, and to supply leaflets for distribution. *Address*:- 21, Ladbroke Square, London, W.